MASTER OF SCIENCE
IN
ENGINEERING SCIENCE

MASTER OF SCIENCE IN ENGINEERING SCIENCE

SIMPLIFIED MICROMECHANICAL MODELS FOR ANALYSIS OF INTERFACE DEBONDING IN A FIBROUS COMPOSITE

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The objective of this study is to develop simplified micromechanical models to analyze the interface debonding between fiber and the matrix materials. Both analytical and simplified finite element models are used to predict the effective transverse elastic modules of fibrous composites with a partial interface crack based on the material properties of their constituents. The simplified finite element model uses springs in the connecting nodes between the fiber and matrix. A detailed finite element analysis, which is programmed using the MATLAB engineering software, is performed to check the accuracy of the simplified models. The simplified models yield accurate effective transverse elastic moduli of various composites with partial interface cracks when compared to the results obtained from detailed finite element analyses.

DESIGN AND IMPLEMENTATION OF A GEOLOCATION SOFTWARE WORKBENCH

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This thesis explores the background and concerns involved in creating a multipurpose software tool that can be used to process electronic signals in an effort to determine the signal's point of origin. A functional workbench utilizing stand-alone software modules was constructed using the MATLAB® software environment. Specific emphasis was placed upon the following aspects: determining the formats for, and actually coding, input and output data file interfaces, propagation path error accounting, geolocation algorithm implementation, arid graphical user interface design. A well-known geolocation method, Time Difference of Arrival (TDOA), was chosen to be the Geolocation Workbench's first example. The result of this effort is a working software model that demonstrates how this workbench can be used effectively by geolocation algorithm developers and geolocation end users alike.

THE FEASIBILITY OF USING TETHERED SATELLITES FOR GEOLOCATION

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Geolocation from space of signals using Time-Difference-of-Arrival (TDOA) methods requires two or more satellites; for low earth orbiting satellites, orbital dynamics dictates that the satellites be in a 'lead-trail' configuration. This configuration limits the geometry for geolocation. The use of a pair of tethered satellites ('high-low' configuration) makes possible another geometry for geolocation. Although tethered satellites have other possible applications worthy of pursuit, a comparison of calculated geolocation accuracy with the current 'lead-trail' configuration is the focus of this thesis.